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ABSTRACT

The primary goals of the National Educational Technology Standards (NETS) project is to enable stakeholders in PreK-12 education to develop national standards for the educational uses of technology that will facilitate school improvement in the United States. The NETS Project will develop standards to guide educational leaders in recognizing and addressing the essential conditions for effective use of technology to support PreK-12 education. The Technology Foundation Standards for Students contained in this document are the first step in the NETS Project. The standards are divided into six broad categories: (1) basic operations and concepts; (2) social, ethical, and human issues; (3) technology productivity tools; (4) technology communications tools; (5) technology research tools; and (6) technology problem-solving and decision-making tools. These categories provide a framework for linking performance indicators found within the Profiles for Technology Literate Students, described for the following grade ranges: PreK-12, 3-5, 6-8, and 9-12. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills. Also included are a list of the NETS partner organizations, the NETS Standards Development Team, and an order form. (AEF)

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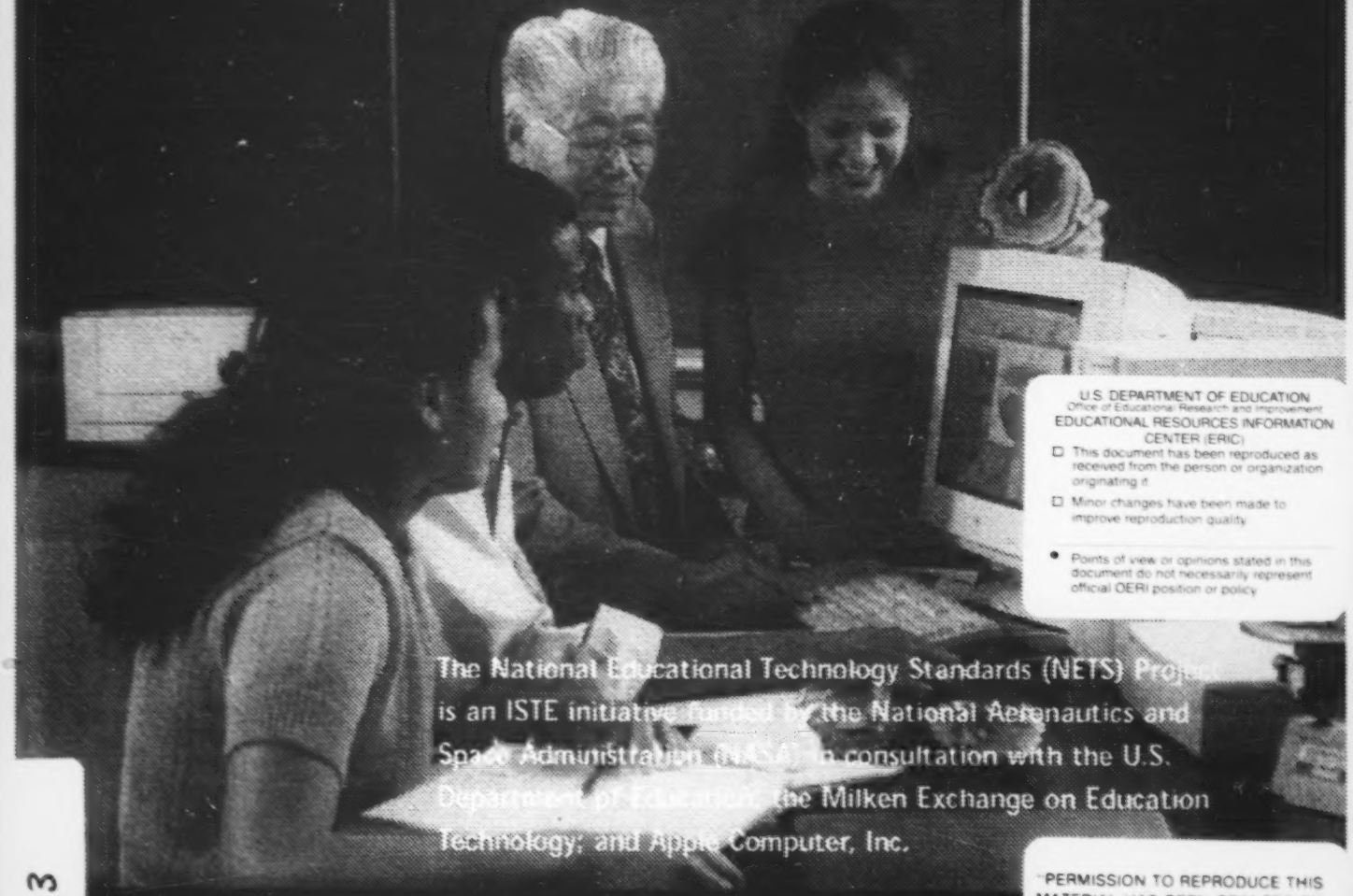
ED 421 971

International Society for Technology in Education

National Educational Technology

Standards for Students



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The National Educational Technology Standards (NETS) Project is an ISTE initiative funded by the National Aeronautics and Space Administration (NASA) in consultation with the U.S. Department of Education, the Milken Exchange on Education Technology, and Apple Computer, Inc.

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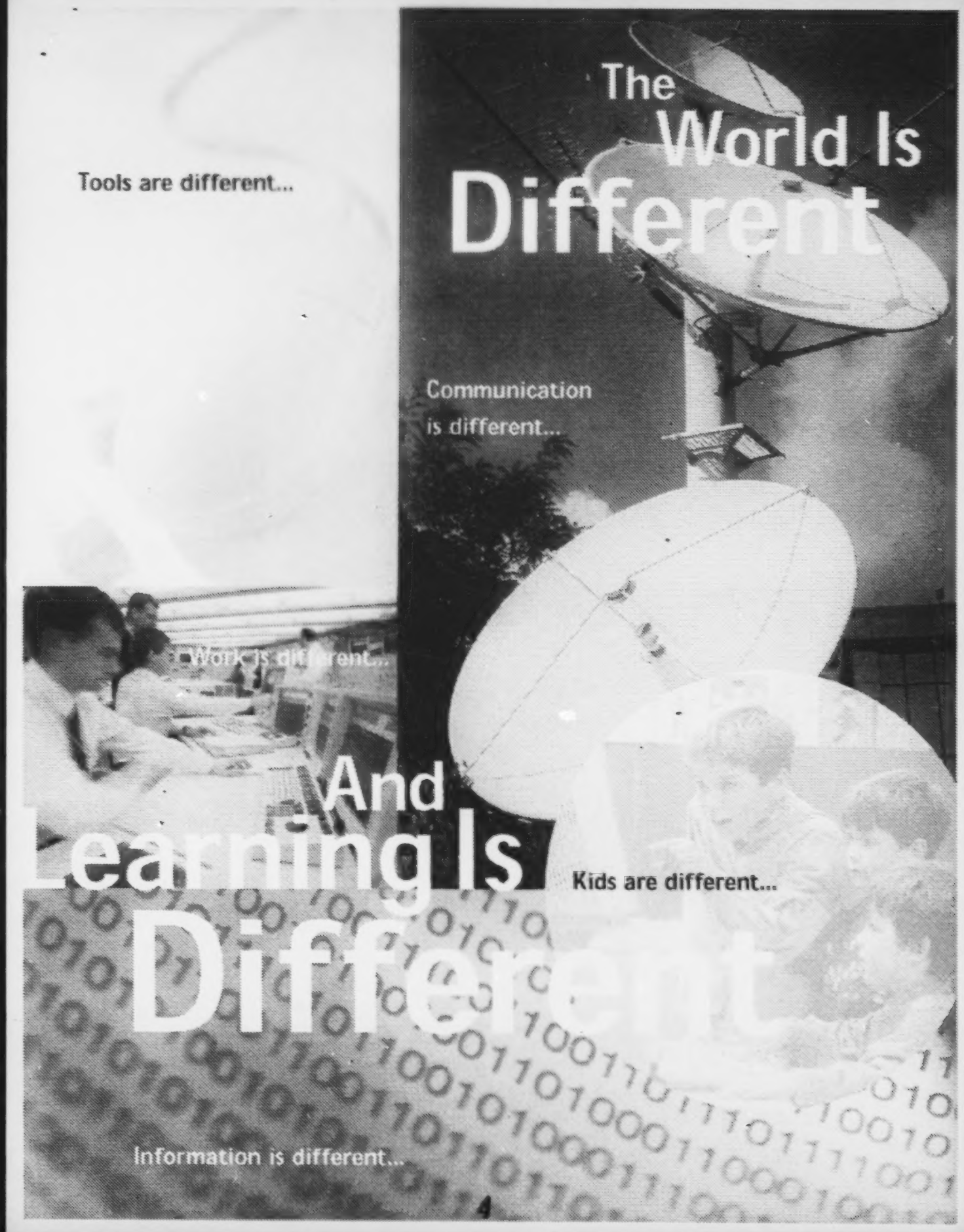
Ready or not...

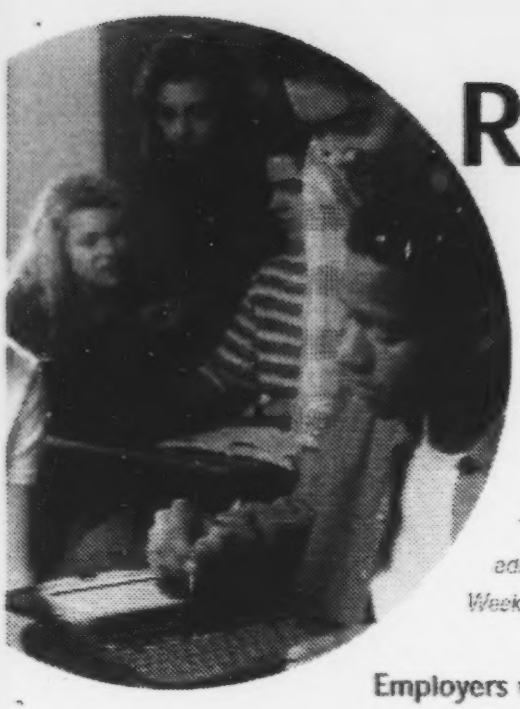

Tools are different...
The World Is Different
Communication is different...
Work is different...
And Learning Is Different
Kids are different...
Information is different...

Our Educational System Must Produce

Technology Capable Kids

To live, learn, and work successfully in an increasingly complex and information-rich society, students must use technology effectively. Within a sound educational setting, technology can enable students to become:

- *Capable information technology users*
- *Information seekers, analyzers, and evaluators*
- *Problem solvers and decision-makers*
- *Creative and effective users of productivity tools*
- *Communicators, collaborators, publishers, and producers*
- *Informed, responsible, and contributing citizens*



All Kids Must Be Ready for a Different World

Parents want it!

Parents want their children to graduate with skills that prepare them to either get a job in today's marketplace or advance to higher levels of education and training.

"In poll after poll, parents say technology is essential to a child's education." (Technology Counts: Taking Technology's Measure, *Education Week*, November 10, 1997)

Employers want it!

Employers want to hire employees who are honest, reliable, literate, and able to reason, communicate, make decisions, and learn.

"To thrive in today's world and tomorrow's workplace, American students must learn how to learn, learn how to think, and have a solid understanding of how technology works and what it can do." (CEO Forum, *School Technology and Readiness Report*, 1997)

Communities want it!

Communities want schools to prepare their children to become good citizens and productive members of society in an increasingly technological and information-based world.

"The community knows that we know computers, we have the skills, and we can use them. Our community realizes that we're the future, we're the growth of this world, and we're the growth of this community." (Greenbriar, Arkansas student, Elizabeth Rhodes, whose technology project, remapping school bus routes, was implemented in her community.)

The nation wants it!

National leaders, the U.S. Department of Education, and other federal agencies recognize the essential role of technology in 21st century education.

"President Clinton, Vice President Al Gore, and a procession of state governors from both political parties have recently endorsed technology as a necessary tool for education. At last year's national education summit in Palisades, N.Y., the governors and business leaders who attended made improving education technology one of two main goals for school change." (Technology Counts: Taking Technology's Measure, *Education Week*, November 10, 1997)

AND MOST OF ALL...KIDS NEED IT!!!

Essential Conditions to Make It Happen

Students in a Chicago elementary school recently used technology to explore the history of Ice Age animals in Illinois. Using the Internet, they "traveled" to the Illinois State Museum (200 miles away) and to the Brookfield Zoo (10 miles away) to gather information and talk with experts via two-way video. Then they constructed an electronic database to organize and analyze their data and shared their findings with other students outside their own school in multimedia reports posted on a Web site titled "Mastadons in Our Own Back Yard."

Successful learning activities such as this depend on more than just the technology. Certain conditions are necessary for schools to effectively use technology for learning, teaching, and educational management. Physical, human, financial, and policy decisions greatly affect the success of technology use in schools.

A combination of essential conditions are required to create learning environments conducive to powerful uses of technology, including:

- *Vision with support and proactive leadership from the education system*
- *Educators skilled in the use of technology for learning*
- *Content standards and curriculum resources*
- *Student-centered approaches to learning*
- *Assessment of the effectiveness of technology for learning*
- *Access to contemporary technologies, software, and telecommunications networks*
- *Technical assistance for maintaining and using technology resources*
- *Community partners who provide expertise, support, and real-life interactions*
- *Ongoing financial support for sustained technology use*
- *Policies and standards supporting new learning environments*

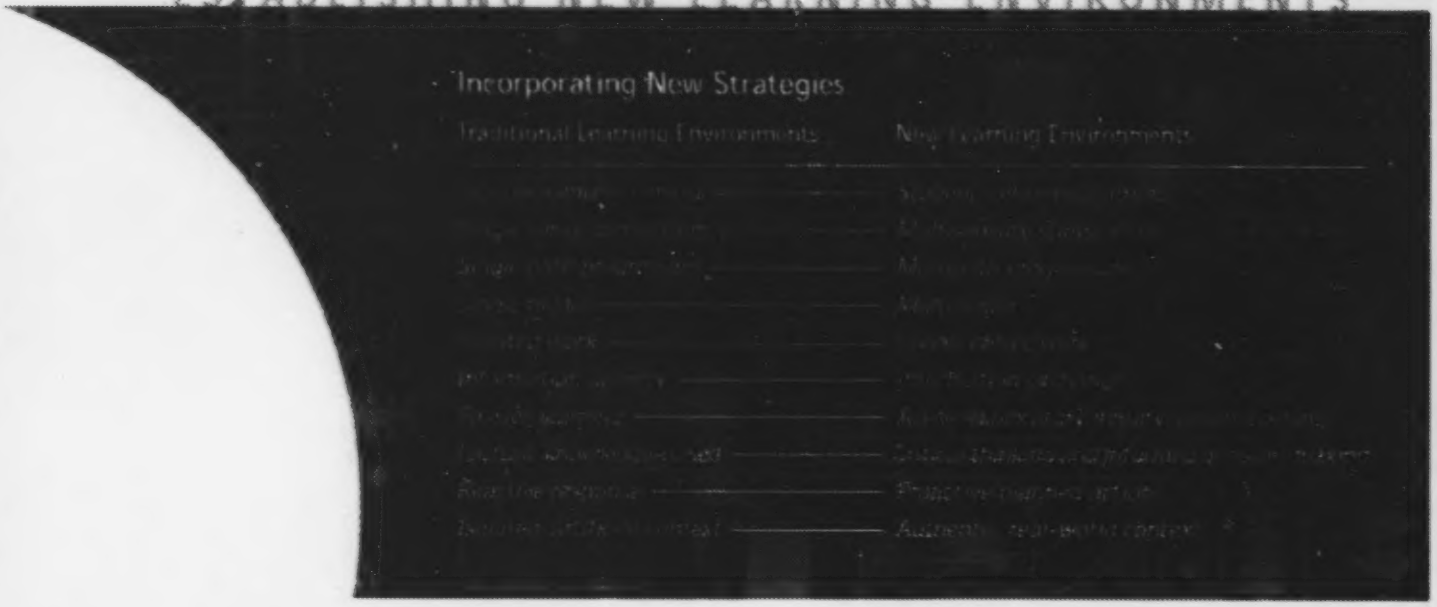
This document is designed to provide teachers, technology planners, teacher preparation institutions, and educational decision-makers with frameworks and standards to guide them in establishing enriched learning environments supported by technology.

The resulting learning environments provide opportunities for students to use technology to find and apply current information and resources, and to apply their academic skills for solving real-world problems. These environments engage students in activities that have educational technology skills and relevant curricular content interwoven.

Traditional educational practices no longer provide students with all the necessary skills for economic survival in today's workplace. Students must apply strategies for solving problems and use appropriate tools for learning, collaborating, and communicating. Today's learning environments must incorporate strategies and tools that prepare students for their futures. The following chart lists characteristics representing traditional approaches to learning and corresponding strategies often associated with new learning environments.

ESTABLISHING NEW LEARNING ENVIRONMENTS

Incorporating New Strategies



The most effective learning environments meld traditional approaches and new approaches to facilitate learning of relevant content while addressing individual needs. The resulting learning environments should prepare students to:

- *Communicate using a variety of media and formats*
- *Access and exchange information in a variety of ways*
- *Compile, organize, analyze, and synthesize information*
- *Draw conclusions and make generalizations based on information gathered*
- *Use information and select appropriate tools to solve problems*
- *Know content and be able to locate additional information as needed*
- *Become self-directed learners*
- *Collaborate and cooperate in team efforts*
- *Interact with others in ethical and appropriate ways*

Teachers know that the wise use of technology can enrich learning environments and enable students to achieve marketable skills. It is still critical that educators analyze the potential benefits of technology for learning and employ it appropriately.

The NETS Project

The primary goal of the ISTE National Educational Technology Standards (NETS) project is to enable stakeholders in PreK–12 education to develop national standards for the educational uses of technology that will facilitate school improvement in the United States. The NETS Project will develop standards to guide educational leaders in recognizing and addressing the essential conditions for effective use of technology to support PreK–12 education. Over the next three years the following sets of standards will be developed or refined.

NETS Documents Under Development and/or Refinement

- Technology Foundation Standards for Students

  describes what students should know about technology and be able to do with technology

- Standards for Using Technology in Learning and Teaching

  describes how technology should be used throughout the curriculum for teaching, learning, and instructional management

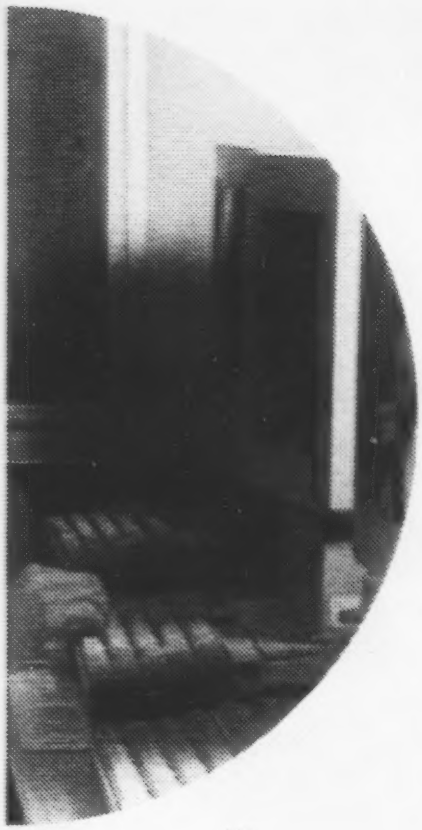
- Educational Technology Support Standards

  describes systems, access, staff development, and support services essential to support effective use of technology

- Standards for Student Assessment and Evaluation of Technology Use

  describes various means of assessing student progress and evaluating the use of technology in learning and teaching

The Technology Foundation Standards for Students contained in this document are the first step in the NETS Project. This document represents the responses to proposed educational technology standards from many groups and individuals across the nation who have participated in conference sessions, technology forum meetings, Internet dialogue, and individually



submitted surveys. These standards and profiles are components of a larger standards document to be released in the upcoming year that will include revised materials and a scope and sequence of educational technology performance indicators. The document will include many examples of learning scenarios where these standards are linked to content learning.

The NETS Project, an ISTE initiative, is funded by the National Aeronautics and Space Administration (NASA) in consultation with the U.S. Department of Education, the Milken Exchange on Education Technology; and Apple Computer, Inc.

The NETS Project was initiated by the International Society for Technology in Education's Accreditation and Professional Standards Committee. ISTE has emerged as a recognized leader among professional organizations for educators involved with technology. ISTE's mission is to promote appropriate uses of technology to support and improve learning, teaching, and administration. Its members are teachers, technology coordinators, education administrators, and teacher educators. ISTE supports all subject area disciplines by providing publications, conferences, online information, and services that help educators combine the knowledge and skills of their teaching fields with the application of technologies for improvement of learning and teaching.

The ISTE Accreditation and Professional Standards Committee has developed:

- *standards for accreditation of teacher preparation programs for specialization in educational computing and technology,*
- *guidelines for the infrastructure needed to support the application of technology in teacher preparation programs, and,*
- *general standards that provide a foundation in technology for all teachers.*

These guidelines have been adopted by the National Council for Accreditation of Teacher Education (NCATE) and are currently being used in the process of accrediting teacher preparation programs in many American universities.
Web address: http://www.ISTE.org

Technology Foundation Standards for All Students

The technology foundation standards for students are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators found within the Profiles for Technology Literate Students (pages 7–16) to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

Technology Foundation Standards for Students

1. Basic operations and concepts

- *Students demonstrate a sound understanding of the nature and operation of technology systems.*
- *Students are proficient in the use of technology.*

2. Social, ethical, and human issues

- *Students understand the ethical, cultural, and societal issues related to technology.*
- *Students practice responsible use of technology systems, information, and software.*
- *Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.*

3. Technology productivity tools

- *Students use technology tools to enhance learning, increase productivity, and promote creativity.*
- *Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.*

4. Technology communications tools

- *Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.*
- *Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.*

5. Technology research tools

- *Students use technology to locate, evaluate, and collect information from a variety of sources.*
- *Students use technology tools to process data and report results.*
- *Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.*

6. Technology problem-solving and decision-making tools

- *Students use technology resources for solving problems and making informed decisions.*
- *Students employ technology in the development of strategies for solving problems in the real world.*

Profiles for Technology Literate Students

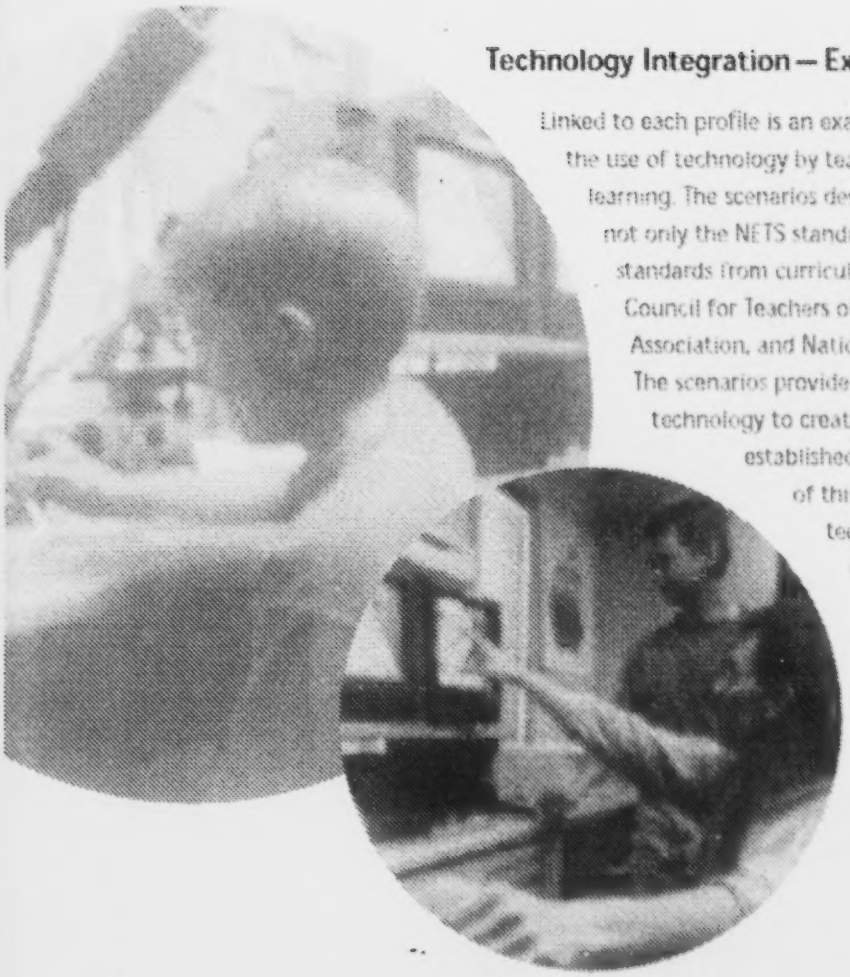
A major component of the NETS Project is the development of a general set of profiles describing technology literate students at key developmental points in their pre-college education. These profiles reflect the underlying assumption that all students should have the opportunity to develop technology skills that support learning, personal productivity, decision-making, and daily life. These profiles and associated standards provide a framework for preparing students to be lifelong learners who make informed decisions about the role of technology in their lives.

The Profiles for Technology Literate Students provide performance indicators describing the technology competence students should exhibit upon completion of the following grade ranges:

- *Grades PreK–2*
- *Grades 3–5*
- *Grades 6–8*
- *Grades 9–12*

These profiles are indicators of achievement at certain stages in PreK–12 education. They assume that technology skills are developed by coordinated activities that support learning throughout a student's education. These skills are to be introduced, reinforced, and finally mastered, and thus, integrated into an individual's personal learning and social framework. They represent essential, realistic, and attainable goals for lifelong learning and a productive citizenry.

The standards and performance indicators are based on input and feedback from educational technology experts as well as parents, teachers, and curriculum experts. In addition they reflect information collected from the professional literature and local, state, and national documents.



Technology Integration – Examples and – Scenarios

Linked to each profile is an example or scenario which exemplifies the use of technology by teachers and students to facilitate learning. The scenarios describe classroom practice that reflects not only the NETS standards and profiles, but also, content standards from curriculum organizations such as the National Council for Teachers of Mathematics, International Reading Association, and National Council for Social Studies. The scenarios provide a curricular context for the use of technology to create varied learning environments being established across America. It is not the purpose of this document to promote the use of technology in isolation, but rather as an integral component or tool for learning and communications within the context of academic subject areas.

Profile for Technology Literate Students

GRADES PREK–2

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 2 students will:

1. *Use input devices (e.g., mouse, keyboard, remote control) and output devices (e.g., monitor, printer) to successfully operate computers, VCRs, audio tapes, telephones, and other technologies. (1)*
2. *Use a variety of media and technology resources for directed and independent learning activities. (1, 3)*
3. *Communicate about technology using developmentally appropriate and accurate terminology. (1)*
4. *Use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning. (1)*
5. *Work cooperatively and collaboratively with peers, family members, and others when using technology in the classroom. (2)*
6. *Demonstrate positive social and ethical behaviors when using technology. (2)*
7. *Practice responsible use of technology systems and software. (2)*
8. *Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)*
9. *Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)*
10. *Gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners. (4)*

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

Curriculum Examples and Scenarios

GRADES PREK–2

Scenario 1:

Animals and Their Sounds

Grade Levels: K–2

Technology Profile Performance Indicators: 1, 2, 3, 4, 8, 9

Subject Areas: Reading, Science

Source: Sharon Fontenot, Prien Lake Elementary and the Louisiana Challenge Grant Leadership Program, Louisiana Tech University

While every child may not be able to see animals in the wild, every child can see, hear, and learn about wild animals through multimedia technology. In Sharon Fontenot's class at Prien Lake Elementary School, students learn to identify polar bears, lions, and other animals from the wild and to recognize their sounds using images, video clips, and sounds on the Wide World of Animals CD-ROM. The teacher models the creative use of technology by making a tape recording based on information from the CD-ROM that incorporates her own voice and fits the group's needs.

Students practice reading and listening skills by answering questions that encourage them to think about both the science and social living issues related to these animals. Where do these animals live? What do they eat? Why do some have thick fur? How do they interact with each other?

Students then create their own stories about what they have learned using Kid Pix ®, a software program that lets them make their own pictures of the animals, assemble them into slide shows, and print out their own books to share with classmates and their families. The teacher can videotape the students' activities as part of their assessment and to share with students and parents.

Scenario 2:

I Lost My Tooth!

Grade Levels: K–2

Technology Profile Performance Indicators: 1, 2, 4, 5, 8, 9, 10

Subject Areas: Health, Language Arts, Social Studies

Source: Ruehm, Diann. (April, 1997). I Lost My Tooth! *Learning and Leading with Technology*, 24 (7), 17–19.

A first grade teacher can use this activity to introduce her class to Internet technology for the first time. Teachers use e-mail once a month to relate how many teeth their students lost along with one special fact about their region or culture. Students share tooth-fairy traditions and other stories from their region.

Using the information from students from around the world, teachers develop activities including creative writing, graphing, art, and social studies. Students use an interactive bulletin board where they post dates when teeth were lost, create a letter as a class about the project to post on the Internet, collect information from other children about tooth fairy stories, develop creative writing stories about their "tooth" experiences and share them with other children via the Internet, initiate electronic conversations about where the other children live, use maps to locate the countries/cities where other children live, and address topics with other children such as weather, politics, clothing, and local heroes of their regions. The students use electronic slide show/drawing software to illustrate the fairy stories, and software to graph the tooth data. Then they write a letter explaining what the graph means and send it to keypals around the world

Profile for Technology Literate Students

GRADES 3 – 5

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 5, students will:

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

1. *Use keyboards and other common input and output devices (including adaptive devices when necessary) efficiently and effectively. (1)*
2. *Discuss common uses of technology in daily life and advantages and disadvantages those uses provide. (1, 2)*
3. *Discuss basic issues related to responsible use of technology and information, and describe personal consequences of inappropriate use. (2)*
4. *Use general purpose productivity tools and peripherals to support personal productivity, to remediate skill deficits, and to facilitate learning throughout the curriculum. (3)*
5. *Use technology tools (e.g., multimedia authoring, presentation, web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)*
6. *Use telecommunications efficiently and effectively to access remote information and communicate with others in support of direct and independent learning and for pursuit of personal interests. (4)*
7. *Use telecommunications and on-line resources (e.g., email, online discussions, web environments) to participate in collaborative problem-solving activities to develop solutions or products for audiences inside and outside the classroom. (4, 5)*
8. *Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem-solving, self-directed learning, and extended learning activities. (5, 6)*
9. *Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)*
10. *Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources. (6)*

Curriculum Examples and Scenarios

GRADES 3–5

Scenario 1:

Global Learning and Observations for a Better Environment (GLOBE)

Grade Levels: 3–5

Technology Profile Performance Indicators: 2, 3, 4, 5, 6

Subject Areas: Science, Social Studies

Source: NASA Classroom of the Future Program

Ms. Smith and her class have made extensive use of online resources such as Exploring the Environment (ETE) found at (http://www.cotf.edu/ete) and Global Learning and Observations for a Better Environment (GLOBE) found at (http://www.globe.gov). She uses ETE to access classroom tested problem-based learning modules that extend and sometimes replace her old paper-based activities. These self-contained resources have provided a new spark of vitality into her science and interdisciplinary periods as they grapple with real-world issues and current data.

Using the GLOBE structure, Ms. Smith has been able to have her students collect information from environmental observations around the school and vicinity, report the data to a processing facility through GLOBE, and use global images created from their data to study local environmental issues. The students have been contributing to an environmental database used by research scientists to improve our understanding of the global environment.

Recently, her students used GLOBE and other electronic resources to research a hot local issue. The community was debating whether to allow a biotechnology firm to locate nearby. Her students chose to analyze this issue very carefully. Students working in groups engaged in collecting and analyzing data about the proposed plant. Ms. Smith set forums in the class so that the students could present their findings and engage in debate. Then students created Web pages to present their findings and arguments to the community. She reports that because of the authenticity and relevance of the issue, her students were even more engaged as they used technology in researching the issues. Parents were pleased to see their children's work on the school's Web site, as viewing the materials at home helped parents feel closer to what the students did in school. Parents also reported subtle changes in their children's attitudes when they were immersed in this hands-on, minds-on, technology-infused classroom.

Profile for Technology Literate Students

GRADES 6–8

Performance Indicators:

All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 8 students will:

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

1. *Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)*
2. *Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)*
3. *Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)*
4. *Use content-specific tools, software and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)*
5. *Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)*
6. *Design, develop, publish and present products (e.g., Web pages, video tapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4,5,6)*
7. *Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)*
8. *Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)*
9. *Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and practical applications to learning and problem solving. (1, 6)*
10. *Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)*

Curriculum Examples and Scenarios

GRADES 6–8

Scenario 1:

Using Technology to Learn about Rocks and Minerals

Grade Levels: 8

Technology Profile Performance Indicators: 4, 5, 6, 7

Subject Areas: Science, Social Studies

Source: Hemmet, Joanie. (1998) Lakeisha's Year in Eighth Grade: Technology Integration Vignette, Part 2. *Learning and Leading with Technology*, 25(7), 27-31.

Lakeisha's eighth-grade class began a unit on rocks and minerals. They explored topics using CD-ROM encyclopedias and stored both the information they found and results from their laboratory sessions, including a week-long rock-simulation program, in their databases. When their studies were complete, Mrs. Perkins helped the students create HyperStudio presentations to share with the class. She also found an Internet site called "Ask a Geologist." Lakeisha and her classmates were then able to e-mail questions about rocks and minerals to the geologists who were sponsoring the site. Lakeisha and her friends were fascinated with the information they received on rocks and minerals in their native area. Lakeisha's science teacher organized a local geologic dig to help students begin their own rock and mineral collections.

Scenario 2:

The Louisiana Labor Market Lesson

Grade Levels: 8

Technology Profile Performance Indicators: 5, 6, 7, 8

Subject Areas: Mathematics, Social Studies

Source: Becky Calloway (1997) Teacher and Students Present LA Labor Lesson at the BESE Meeting. Louisiana Challenge Grant Newsletter, 2 (1), 9.*

At Marthaville Elementary, a small rural K-8 school, Laura Strahan and her eighth-grade students studied the Louisiana labor market in their math class. Students used the Internet to search for the top 20 projected occupations in the state on the Louisiana Department of Labor's Web site (http:www.ldol.state.la.us/). The US Department of Labor updates its statistics daily and receives and distributes labor information from each state.

Students were divided into groups. Each group selected five occupations and developed a survey for them. Each survey was used to query other individuals regarding the estimated annual income for those occupations. The students then assisted in analyzing the survey results, comparing results to actual salaries as reported on the Department of Labor and other Internet sites, calculating averages of estimates, and displaying the information in appropriate graph format.

Students from Ms. Strahan's class presented their results to the Board of Elementary and Secondary Education to illustrate the importance of providing technology resources to schools in Louisiana. This lesson provides numerous opportunities for use of technology to access, analyze, and present information including access through telecommunications, document production using the word processor, data base manipulation, analysis using the spreadsheet, illustration of results using graphing software, and presentation of the results via Web or electronic slideshow software.

*Full plan at: http://www.challenge.state.la.us/k12act/ltta/ltalabor/index.html

Profile for Technology Literate Students

GRADES 9–12

Performance Indicators:

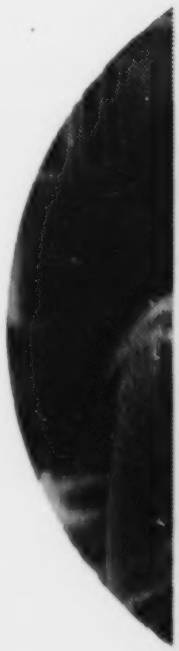
All students should have opportunities to demonstrate the following performances.

Prior to completion of Grade 12 students will:

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

1. *Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning, and workplace needs. (2)*
2. *Make informed choices among technology systems, resources, and services. (1, 2)*
3. *Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)*
4. *Demonstrate and advocate legal and ethical behaviors among peers, family, and community regarding the use of technology and information. (2)*
5. *Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)*
6. *Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)*
7. *Routinely and efficiently use on-line information resources to meet needs for collaboration, research, publications, communications, and productivity. (4, 5, 6)*
8. *Select and apply technology tools for research, information analysis, problem-solving, and decision-making in content learning. (4, 5)*
9. *Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)*
10. *Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)*



Curriculum Examples and Scenarios

GRADES 9–12

Scenario 1:

Presidential Elections

Grade Levels: High School

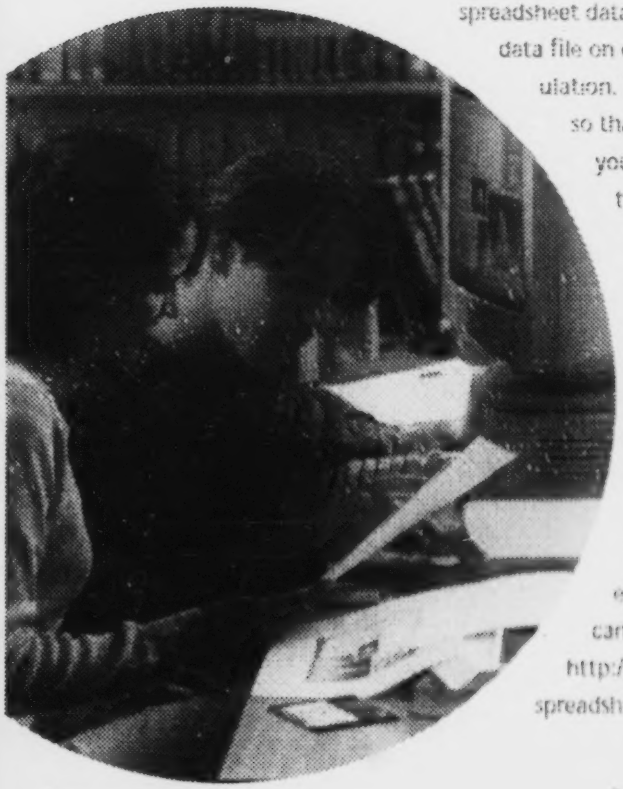
Technology Profile Performance Indicators: 5, 7, 8

Subject Areas: Social Studies, Language Arts, Mathematics

Source: Based on a lesson created by a Southern California teacher and presented in a class at California State University, Los Angeles.

The U.S. system of presidential elections can be a mystery for many citizens. Teaching middle school or high school students about the Electoral College can be quite a challenge. Mr. Sanchez, an high school social studies teacher in Southern California, developed an activity for his students that involves election data from the closest presidential election in history—the 1960 election between John F. Kennedy and Richard M. Nixon. This activity helps students understand the Electoral College and some of the strategies used by presidential candidates. Complete, state-by-state election results can be found at the following web site: http://www.geocities.com/CapitolHill/6228/elections.htm

Mr. Sanchez divides his students into groups and gives each a spreadsheet containing data from the 1960 presidential election. The spreadsheet contains the popular and Electoral College results from every state and territory. Formulas at the bottom of the columns calculate the total number of popular votes and Electoral votes for each candidate.



The groups are asked to conduct a series of investigations by manipulating the spreadsheet data. Students have printouts of the original data and the original data file on disk so that they can restore the spreadsheet after each manipulation. The questions they investigate are: "Can you change the data so that Mr. Nixon wins the election rather than Mr. Kennedy?" "Can you change the outcome of the election by changing the election results in only one state?" "Two states?" "Three states?" "Can you change the popular vote so that one candidate wins the popular election but loses the Electoral College results?" "Can you change the popular vote so that the same candidate loses the popular vote but wins the election (via the Electoral College results)?" "What is the least number of states you can change to have one candidate win the popular vote but lose the election?" These "what if?" activities help students gain an understanding of the Electoral College.

Finally, the groups prepare a multimedia report on the 1960 election using HyperStudio. They can include pictures of the candidates, charts and graphs from the election (e.g., http://www.multied.com/elections/) and a discussion of their spreadsheet manipulations.

The NETS Project Partnership

Joining ISTE as project partners in developing technology standards for Pre K-12 education are organizations representing major professional education groups in the United States. Each partner organization provides leadership to a broad spectrum of educators and includes members throughout the nation. Each of the partner organizations brings unique strengths to the project. These partners provide representation from the educational community including: curriculum specialists, leaders in State Departments of Education, school principals, teachers, school board members, librarians, representatives from the business community, and technology experts. The National Educational Technology Standards (NETS) partner organizations include:

- *American Federation of Teachers (AFT)*
- *American Association of School Librarians (AASL), a division of the American Library Association (ALA)*
- *Association for Supervision and Curriculum Development (ASCD)*
- *Council of Chief State School Officers (CCSSO)*
- *Council for Exceptional Children (CEC)*
- *International Society for Technology in Education (ISTE)*
- *National Association of Elementary School Principals (NAESP)*
- *National Association of Secondary School Principals (NASSP)*
- *National Education Association (NEA)*
- *National School Boards Association's (NSBA) Institute for the Transfer of Technology to Education*
- *National Foundation for the Improvement of Education (NFIE)*
- *Software Publishers Association (SPA)*

As the NETS Project unfolds, it is important to note that a significant strength of the project is the participation of representatives from the major curriculum organizations. The curriculum liaisons from each subject area participate in the writing teams responsible for linking the technology standards with the standards from their organization's academic subject area. Liaisons representing major curriculum groups will participate in the development of technology standards for their subject areas. These curriculum liaisons will participate in work sessions designed to identify standards relating specifically to each curriculum area and to build interdisciplinary connections among the curricular areas. Curriculum organizations slated to join the NETS Partnership are:

- *International Reading Association (IRA)*
- *National Council for Geography Education (NCGE)*
- *National Council for the Social Studies (NCSS)*
- *National Council of Teachers of Mathematics (NCTM)*
- *National Council for the Teachers of English (NCTE)*
- *National Science Teachers Association (NSTA)*

Co-sponsors for the NETS Project have provided valuable expertise and contributed significant resources to the development of these standards. Current co-sponsors joining ISTE and the NETS Partnership are:

- *U.S. Department of Education*
- *National Aeronautics and Space Administration (NASA)*
- *Milken Exchange on Education Technology*
- *Apple Computer, Inc.*

NETS Standards Development Team

NETS Project Leadership Team

Lajeane Thomas, Chair
Louisiana Tech University

Gary Bitter, Co-Chair
Arizona State University

David Barr
Illinois Mathematics and Science Academy

Ed Coughlin
Milken Exchange on Education Technology

Joyce Fricke
Jenks Public Schools, OK

Chris Held
Technology Alliance of Washington

M.G. (Peggy) Kelly
California State University, San Marcos

Don Knezek
Education Service Center, San Antonio, TX

Cheryl Lemke
Milken Exchange on Education Technology

Dick Moody
Apple Computer, Inc.

Dave Mountund
ISTE

Heidi Rogers
University of Idaho, Coeur d'Alene

Harriet Taylor
Louisiana State University

James Wiebe
California State University, Los Angeles

Frank Withrow
NASA Classroom of the Future Program

NETS Project Partners Representatives

Edward McElroy
American Federation of Teachers (AFT)

Julie Walker
American Association of School Librarians (AASL), a division of the American Library Association (ALA)

Vicki Hancock
Association for Supervision and Curriculum Development (ASCD)

Art Sheekey
Council of Chief State School Officers (CCSSO)

Christine Mason
The Council for Exceptional Children (CEC)

Lynne Schrum
International Society for Technology in Education (ISTE)

Ronald Aregiado
National Association of Elementary School Principals (NAESP)

Tom Koerner
National Association of Secondary School Principals (NASSP)

Barbara Stein and Barbara J. Yentzer
National Education Association (NEA)

Anne Ward and Cheryl Williams
National School Boards Association (NSBA) Technology Program

Carol Edwards
National Foundation for the Improvement of Education (NFIE)

Sue Kamp
Software Publishers Association (SPA)

Co-sponsors, Funders, Advisors

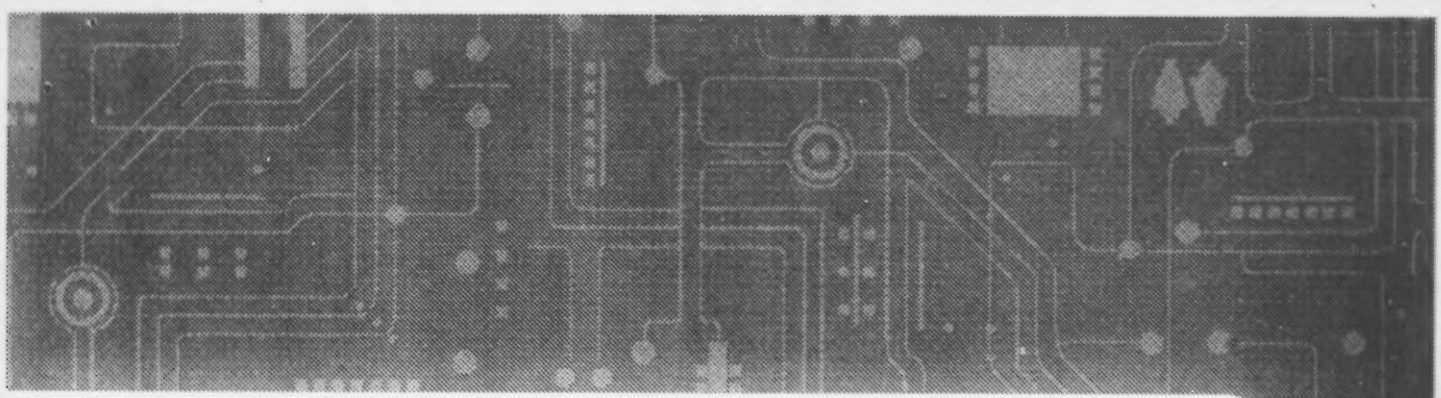
- *U.S. Department of Education*
  Linda Roberts, Janelle Leonard, Kelly Green, Cheryl Garnetta, Peirce Hammond
- *National Aeronautics and Space Administration*
  Malcom Phelps, Frank Withrow, James Mitchell
- *Milken Exchange on Education Technology*
  Cheryl Lemke, Ed Coughlin
- *Apple Computer, Inc.*
  Dick Moody

Contact Information

For further information contact:

Lajeane Thomas, NETS Project Director
Louisiana Tech University
P. O. Box 3161, Ruston, LA 71272
Phone: 318.257.3923
Fax: 318.257.4916
E-mail: lthomas@latech.edu

International Society for Technology in Education
1787 Agate Street, Eugene, OR 97403-1923
Phone: 541.346.4414
Web site: http://www.ISTE.org



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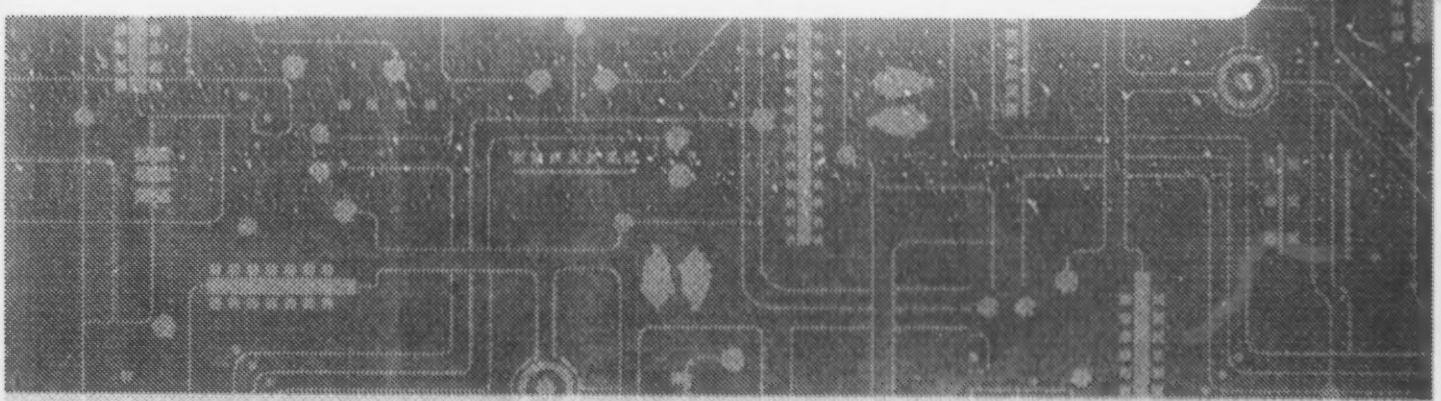

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INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION
1787 AGATE STREET EUGENE OR 97403-1923
PHONE: 541-346-4414 FAX: 541-346-5890 WEB SITE: HTTP://WWW.ISTE.ORG